Cr(VI) Bioremediation Project Hanford 100H

Update for April-July 2006

In April 2006, at the Hanford 100H site, we conducted a conservative tracer (KBr) injection into Well 699-96-45 (injection well) followed by pumping from Well 699-96-44 (monitoring well) located 16 ft downgradient from the injection well. During pumping, Hydrolab electrodes were used for on-site measurements of DO, pH, temperature, and electrical conductivity of pumped water. In April and May 2006, water samples were collected from both injection and monitoring wells. Analytical results show that almost two years after the HRC injection into the Hanford-formation aquifer, Cr(VI) concentration in the injection well was still below the detection limit (<0.28 μg/l). In the monitoring well, Cr(VI) was not detected in two water samples, Cr(VI) concentration was 15 μg/l (which is below the MCL of 50 μg/l) in one water sample near the water table, and it was 60 μg/l in pumped water (most likely resulting from groundwater mixing over a larger area around the pumping well). Note that in August 2004, before the HRC injection, Cr(VI) concentration was 86 μg/l. During the pumping test in April 2006, the dissolved oxygen (DO) concentration ranged from 2.7 mg/l to 6.4 mg/l, which was also below that before the HRC injection (8-10 mg/l in August 2004). Microbial analyses of water samples collected in April-May 2006 show that the biomass was about 1 (monitoring well) to 2 (injection well) orders of magnitude greater than that before the HRC injection, which confirms the long-lasting effect of HRC on enhancing the microbial activity in groundwater.

The goal of on-going field investigations at Hanford 100H site is to obtain the information necessary for the evaluation of the efficacy of long-term in-situ biostimulation of groundwater. In June-July 2006, two new boreholes (C5191 and C5192) were drilled using a cable-tool drilling rig and cored using a split-spoon sampler. The boreholes were drilled through the Hanford sands/gravels and terminated within the Ringold mud. Sediment samples were collected from 30 ft depths to a depth of 52 ft in Well C5191, and to a depth of 62 ft Well C5192. The boreholes were cased and developed to be used as monitoring wells. The groundwater table is encountered at a depth of 40.5 bgs. All sediment samples were collected into sterilized liners and preserved for further microbial and geochemical analyses. Two samples were sent to LBNL for microbial analysis, one sample was sent to Sequoia Analytical Inc. for the evaluation of metals and common ions, and one sample was stored at PNNL. The results of microbial and geochemical analyses of sediments will be used to corroborate with the results of numerical modeling, using TOUGHREACT-BIO, and geophysical tomography of the spatial distribution of HRC within the aquifer biostimulation zone.

In August 2006, we plan to equip the two new wells with specially designed groundwater samplers, rubber packers, and geophysical access pipes. These wells, along with previously drilled two wells, will be used for monitoring microbial, geochemical, and geophysical conditions in groundwater, as well as for assessing the potential for Cr(III) reoxidation. No additional HRC injection is planned at this time.

Photograph of July 2006 drilling and sampling